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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,523	08/13/2001	Tomohiko Shibata	782_181	8032

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EXAMINER	
SONG, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 01/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/928,523	SHIBATA ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 September 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-5,8-11 and 19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-5,8-11 and 19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *10/27/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2-5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaudo et al (US 6,533,874) in view of Razeghi (US 5,599,732).

Vaudo et al discloses an apparatus for growing a (Ga,Al,In) nitride on a substrate using Hydride vapor phase epitaxy (HVPE) (Abstract). Vaudo et al discloses the HVPE reactor **52** is provided with feed ports **72, 74, 76** and **78**, HCl is introduced to the reactor in feed ports **72**, **76'**, and **78'** (col 10, ln 1-67) and a substrate **56**. Vaudo et al also teaches feed port **74** accommodates the introduction of ammonia or other nitrogen species into the reactor in the direction and a vessel **67** of molten aluminum is provided in gas flow communication with feed port **76** (col 11, ln 1-40). Vaudo et al also teaches the growth of Al-containing nitride compounds such as AlN and AlGaN is complicated and to circumvent problems the entire growth reactor and or reactor liner which are employed should be constructed of alternative high temperature compatible materials, such as sapphire or graphite (col 11, ln 40-67). Vaudo et al also discloses a multi-zoned hot-wall reactor, where the temperature of the molten metals is independently controlled and temperatures of 1000-1400°C are employed (col 12, ln 1-15). Vaudo et al discloses aluminum chloride is transported to a deposition zone, this reads on applicant's downstream

zone, where it reacts with ammonia to from AlN (col 11, ln 15-25). Vaudo et al discloses a vessel 67, this reads on applicant's material holder and upstream zone, and a substrate holder 60

Vaudo et al teaches the reactor should be made of high temperature compatible materials, such as sapphire or graphite. Vaudo et al does not teach the reactor is made of aluminum nitride.

In a method of using a coated reactor for growing III-V semiconductor films, note entire reference, Razeghi teaches all surface of a growth reaction chamber is coated with a barrier coating capable of withstanding high temperatures and not reacting with reactants and dopants utilized at high temperatures and the coating is AlN (col 1, ln 55 to col 2, ln 10). Razeghi also teaches a quartz reaction tube (col 2, ln 20-25) and the AlN coating is deposited using metallo-organic chemical vapor deposition (MOCVD) (col 3, ln 50-67). Razeghi also teaches a stable barrier layer or buffer layer of AlN is formed that passivates the growth environment and prevents any oxygen impurities from reacting in the following deposition (col 3, ln 1-30). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Vaudo et al with Razeghi's AlN coated quartz reactor because AlN is capable of withstanding high temperatures and not reacting with reactants and dopants utilized at high temperatures and AlN prevents oxygen and other impurities from reacting with a growing semiconductor layer (col 1, ln 65 to col 2, ln 5).

Referring to claim 2, the combination of Vaudo et al and Razeghi teach the entire growth reactor and or reactor liner which are employed should be constructed of alternative high temperature compatible materials and AlN is a high temperature compatible material. The combination of Vaudo et al and Razeghi does not teach the entire growth reactor is made of AlN. It would have been obvious to a person of ordinary skill in the art at the time of the invention to

modify combination of Vaudo et al and Razeghi by making the whole reactor of AlN because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Referring to claim 3-5, the combination of Vaudo et al and Razeghi teaches a quartz reactor, this reads on applicant's silicon oxide based material, and coating the reactor with AlN using a MOCVD method, this reads on applicant's thermal CVD.

3. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaudo et al (US 6,533,874) in view of Razeghi (US 5,599,732) as applied to claims 1-7 above, and further in view of Mayeda (US 5,614,249) or Kim et al (US 5,728,940).

The combination of Vaudo et al and Razeghi teach a double structure rector ('874 Fig 2), a quartz reactor, gas supply means, and a hot wall reactor, which inherently has heaters. The combination of Vaudo et al and Razeghi does not teach a gas leak detecting means.

In an apparatus for detecting a leak in a chemical vapor deposition, note entire reference, Mayeda teaches a deposition apparatus with a plurality of access channels for a test gas, which allows specific leak testing at selected points in the apparatus (col 2, ln 20-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Vaudo et al and Razeghi with Mayeda's leak detection system to prevent damage ('249 col 1, ln 45-67).

In an apparatus for detects leaks in a semiconductor device, note entire reference, Kim et al teaches a leakage gas detector **11** installed in the semiconductor manufacturing device for detecting the leakage of a reaction gas used in a semiconductor device manufacturing process (col 1, ln 1-67) It would have been obvious to a person of ordinary skill in the art at the time of

the invention to modify the combination of Vaudo et al and Razeghi with Kim et al's leakage detector to increase the lifespan of the apparatus and prevent explosions (col 1, ln 15-30).

Referring to claims 9-11, the combination of Vaudo et al, Razeghi and Kim et al or the combination of Vaudo et al, Razeghi and Mayeda et al teach all of the structural limitations of claims 9-11. Claims 9-11 also contain method limitations, which are considered intended use and the apparatus taught by the combination of Vaudo et al, Razeghi and Kim et al or the combination of Vaudo et al, Razeghi and Mayeda et al would inherently be capable of performing the claimed intended use of the apparatus.

Response to Arguments

4. Applicant's arguments filed 9/30/2003 have been fully considered but they are not persuasive.

Applicant's argument that substituting Razeghi's AlN coated quartz for the sapphire or graphite in Vaudo completely flies in the face of the express teachings in Vaudo is noted but is not found persuasive. Vaudo teaches " the entire growth reactor and or reactor liner which are employed should be constructed of alternative high temperature compatible materials, **such as** sapphire or graphite" in column 11, lines 64-67. Vaudo et al merely teaches examples of high temperature compatible materials and is not limited to those materials. Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 440 F.2d 442, 169 USPQ 423 (CCPA 1971) and MPEP 2123. Vaudo et al broadly teaches using high temperature compatible materials and specifically teaches sapphire and graphite Razeghi teaches an AlN coating capable of withstanding high

temperature and not reacting at high temperatures (col 1, ln 65 to col 2, ln 5). Substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06). Furthermore, Vaudo et al teaches quartz parts incorporate significant impurities into growing films. Razeghi teaches a means to solve this problem by using an ALN coated reactor. Razeghi teaches a coated reaction chamber forms semiconductor materials, with substantially less impurities (col 3, ln 64-67). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Vaudo et al with Razeghi's AlN liner to reduce impurities and because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Applicant's argument that Vaudo implicitly discloses that AlN is not suitable is noted but is not found persuasive. This is mere attorney argument, which lacks evidence; therefore is not found persuasive. Furthermore, Vaudo et al merely teaches specific examples of high temperature compatible materials, such as sapphire and graphite, and is not limited to those embodiments. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Vaudo et al by using AlN, which taught by Razeghi to be a high temperature compatible material.

Applicant's argument that the combination of Vaudo et al and Razeghi does not teach an inner reactor surrounded by an outer reactor is noted but is not found persuasive. The combination of Vaudo et al and Razeghi teaches a liner of AlN, which reads on applicant's inner reactor, which is surrounded by a quartz reactor, this reads on applicant's outer reactor. Therefore, the combination of Vaudo et al and Razeghi teaches the limitations of claim 8.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kang et al (US 6,197,683) teaches a metal source gas is mixed with a carrier gas such as Ar or N_2 to provide a smooth flow into a deposition chamber (col 6, ln 5-35).

Usui et al (JP 2000-91234) teaches HCl is supplied from an introducing pipe with a carrier gas in a HVPE process (Abstract).

Radhakrishnan (US 5,650,361) teaches an AlN chamber used for the deposition of AlN films (col 4, ln 1-15 and Abstract).

Razeghi et al (US 6,271,104) teaches all surface of a growth reaction chamber are coated with a barrier coating capable of withstanding high temperatures and not reacting with the reactants and the coating is preferably AlN (col 3, ln 15-50).

Molnar (US 6,086,673) teaches a HVPE apparatus, note Fig 1.

Ueda et al (US 6,117,213) teaches a HVPE apparatus using to form AlN (col 3).

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

ROBERT KUNEMUND
PRIMARY EXAMINER